Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study

Statewide Model Validation

final

report

prepared for

Metropolitan Transportation Commission and the California High-Speed Rail Authority

prepared by

Cambridge Systematics, Inc.

with

Mark Bradley Research and Consulting

July 2007

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Oakland, California 94607

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1.0 Introduction

1.1 PURPOSE OF THE REPORT

The focus of this report is on the validation of the combined interregional and intraregional (urban) models for the Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study. This statewide model was estimated from a combination of existing and new household and intercept traveler surveys collected in California, and combined with intraregional trips generated from regional and statewide sources. There is a full set of new interregional models, including trip frequency, party size, and destination and mode choice models included in this statewide model. These models are segmented by trip purpose, distance, and location of the interregional trip households.

This report includes information on the calibration process, data used for observed travel behavior, and resulting calibration parameters for the interregional trips. In addition, this report includes summaries and reasonableness checks on the intraregional trips derived from the metropolitan planning organizations (MPO) trip tables. These are not separately validated or calibrated because each MPO has provided assurances that these trip tables are validated. The base year for the model validation process is 2000. This report does not include a description of the model development process or integration of the interregional and intraregional trips, because these were documented separately (see below).

1.2 OVERALL MODEL DESIGN

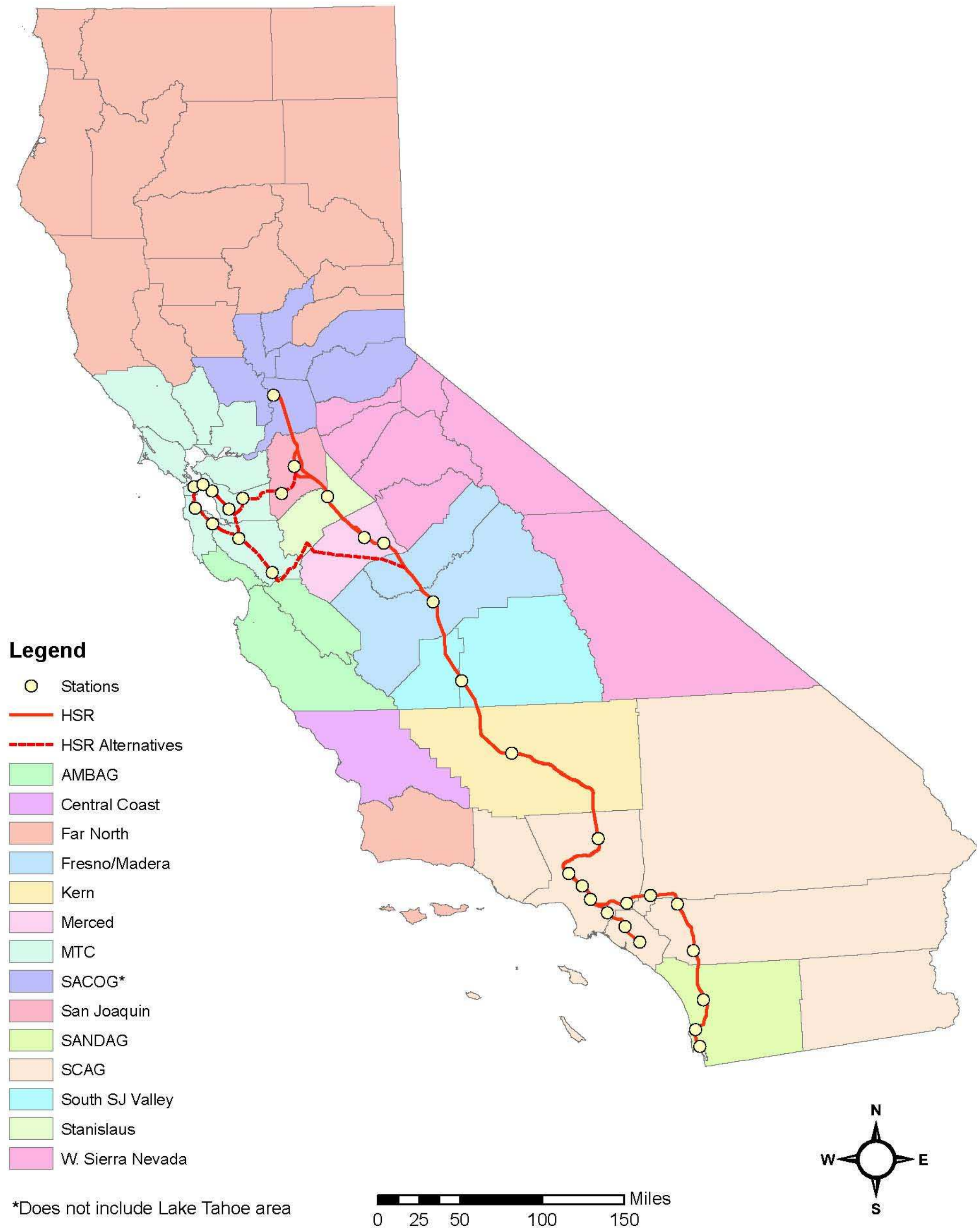
The Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study includes the following components:

- Intraregional travel;
- Interregional travel;
- External travel; and
- Trip assignment.

Intraregional trips include all trips with both ends in one of the three urban areas with more than one proposed high-speed rail station. These areas are the San Francisco Bay Area, Greater Los Angeles, and San Diego regions. Sacramento also is considered to ensure that this capability is available for future purposes. The metropolitan planning organizations (MPO) representing these areas are the Metropolitan Transportation Commission (MTC), the San Diego Association of Governments (SANDAG), the Southern California Association of

Governments (SCAG), and the Sacramento Area Council of Governments (SACOG). These urban areas are presented in Figure 1.1.

Figure 1.1 California Urban Areas and HSR Station Locations



Interregional trips include all trips with both ends in California and whose origin and destination are in different urban areas (or different counties outside the urban areas) having proposed high-speed rail stations.

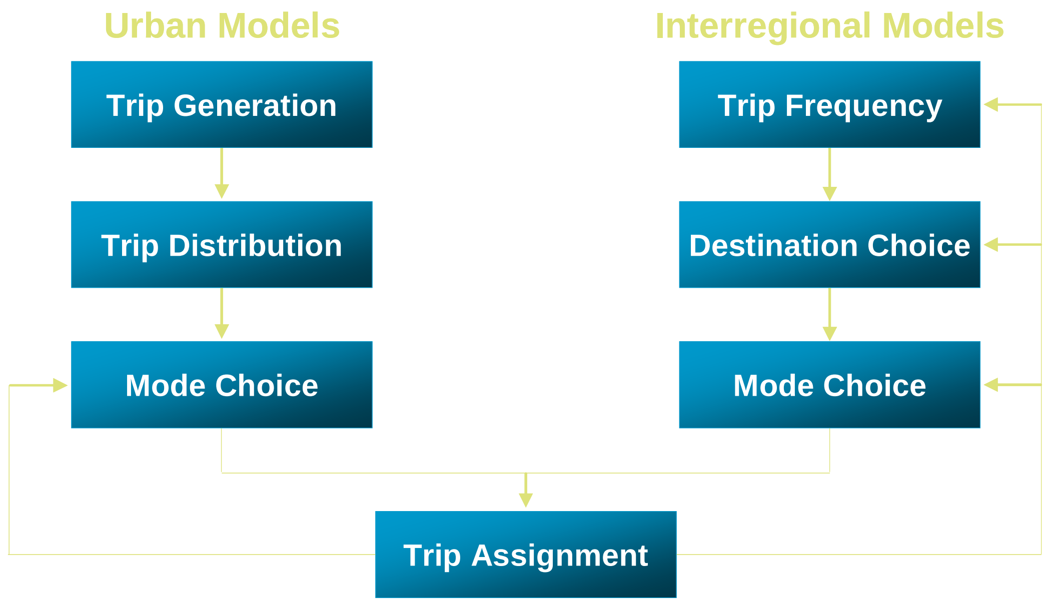
External trips include trips with one end outside California and one end in an urban area with a proposed high-speed rail station.

We recognize that some urban trips may be longer than some interregional trips by this definition and vice-versa. However, these definitions do clearly fit in with urban and statewide planning definitions, and do identify most interregional trips as those that begin or end outside an urban area. One example of an anomaly is a trip from Modesto to San Jose (defined as an interregional trip), which is similar in distance to a trip from Palmdale to Los Angeles (defined as an urban trip). Even taking these anomalies into consideration, there was consensus that the definition of urban and interregional trips fit well with most trips in the system, and that the models proposed for each would adequately address the behavioral nature of each trip type. In addition, as discussed below, we have segmented the interregional trips into short trips (less than 100 miles) and long trips (longer than 100 miles) to help address this issue.

Trip assignment includes the merging of the urban, interregional, and external trips into modal trip tables that are assigned to highway, rail, and air networks. These assignments were validated in the base year and forecast year to evaluate reasonableness and accuracy compared to observed data sources. The model base year is 2000 and the forecast year is 2030. The California interregional models explicitly model peak and offpeak travel for both intraregional and interregional trip movements.

The integrated modeling process for the development of the statewide model is presented in Figure 1.2. This process shows that the accessibility of the system (represented by travel time) is included in the mode choice models and in the interregional trip frequency and destination choice models. This feature allows us to estimate the induced travel for the interregional travel market.

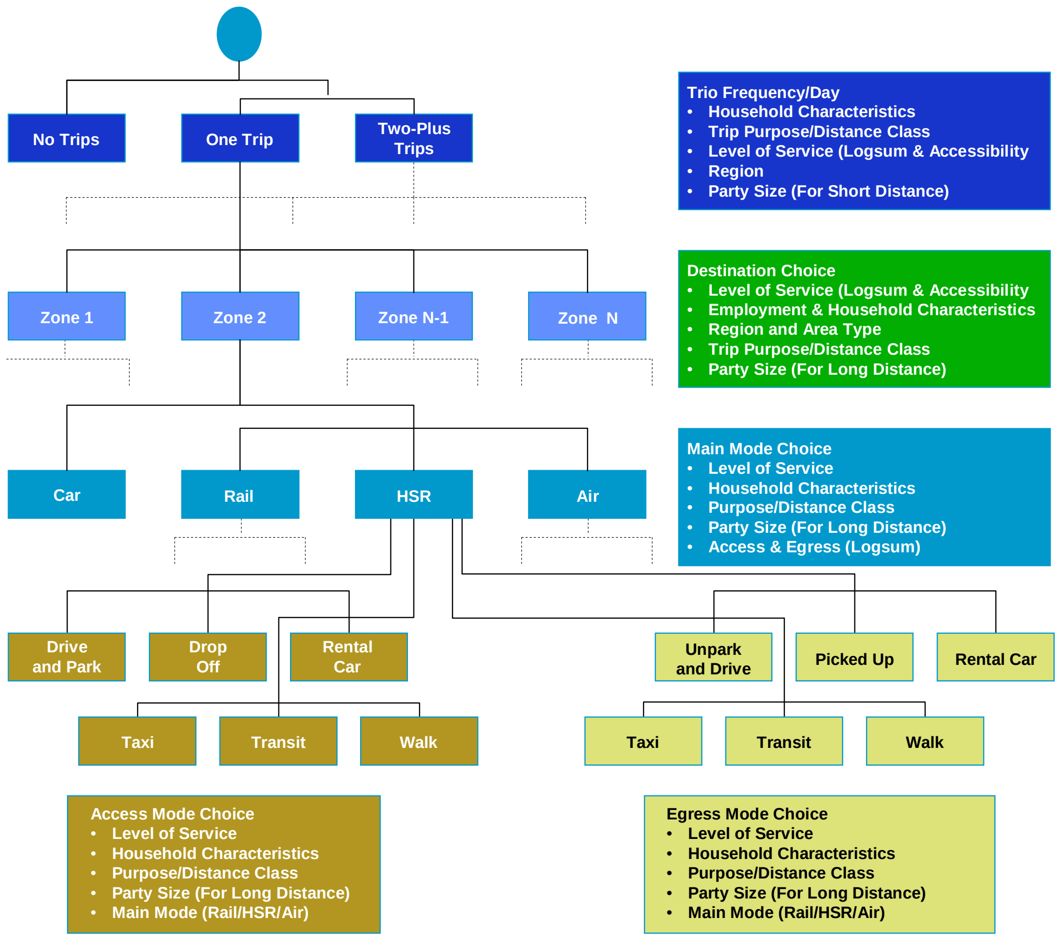
Figure 1.2 Integrated Modeling Process



The interregional models are comprised of four sets of models: trip frequency, destination choice, main mode choice, and access/egress mode choice. The structure and contents of the interregional modeling system is presented in Figure 1.3.

The trip frequency model component predicts the number of interregional trips that individuals in a household will make based on the household's characteristics and location. The destination choice model component predicts the destinations of the trips generated in the trip frequency component based on zonal characteristics and travel impedances. The mode choice components predict the modes that the travelers would choose based on the mode service levels and characteristics of the travelers and trips. The mode choice models include a main mode choice, where the primary interregional mode is selected, and access/egress components, where the modes of access and egress for the air and rail trips are selected.

Figure 1.3 Interregional Model Structure



The market segmentations used for the models are:

- Purpose:
  - Business (peak-period);
  - Commute (peak-period);
  - Recreation (offpeak-period); and
  - Other (offpeak-period).
- Distance range/residence area type:
  - Less than 100 miles, from large MPO regions;
  - Less than 100 miles, from small MPO regions; and
  - More than 100 miles.
- Household size – 1 person, 2 people, 3 people, more than 4 people;
- Household income range – Low, medium, or high;

- Household auto-ownership – 0, 1, 2+;
- Household number of workers – 1) no workers, 2) 1 worker, 3) 2+ workers; and
- Party size: Traveling alone, traveling with others.

The distance ranges of less than or greater than 100 miles were determined by reviewing the trip length distributions from the surveys and judgment about behavior for short versus long trips. Party size is a segmentation variable primarily for the Recreation and Other segments, because it has a large effect on the travel cost of the car mode versus the other modes, and thus on the choices throughout the model chain.

1.3 Contents of the Report

There are seven sections in this report: the introduction, a discussion of data sources, calibration of each model component, and a summary of the validation. Data sources include travel surveys, ridership counts, and traffic volumes. Model components include trip frequency, destination choice, mode choice, and trip assignment models.

This report builds on several other reports developed in earlier stages of this project:

- *Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study Interregional Model System Development*, Cambridge Systematics, Inc., with Mark Bradley Research & Consulting, August 2006;
- *Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study Levels of Service Assumptions and Forecast Alternatives*, Cambridge Systematics, Inc., with Systra Consulting, Inc. and Citilabs, August 2006; and
- *Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study Socioeconomic Data, Transportation Supply, and Base Year Travel Patterns Data*, Cambridge Systematics, Inc., December 2005.

These reports are available from Metropolitan Transportation Commission and the California High-Speed Rail Authority (CHSRA). These reports are contained on the CHSRA web site[1] as part of the Ridership and Revenue Study.

[1] http://www.cahighspeedrail.ca.gov/ridership/

2.0 Data for Model Validation

A variety of travel survey data sources, ridership, and traffic count data were used for model calibration and validation of the interregional travel models. These sources are summarized below. Data sources developed for use in model estimation of the interregional travel models were reported in the *Interregional Model System Development* report.

2.1 TRAVEL SURVEYS

Travel surveys were combined to create a comprehensive set of data for use in calibrating the trip frequency, destination choice, and mode choice models. The following surveys were used for each of the interregional trip purposes:

- The American Traveler Survey (ATS) was used to validate the business, recreation, and other long trip purposes;
- The Census Transportation Planning Package (CTPP) was used to validate the commute long and commute short trip purposes; and
- The California Statewide Travel Survey was used to validate the business, recreation, and other short trip purposes.

These surveys are described below for the relevant trip purposes used for the statewide model validation dataset. The datasets are summarized by major market (based on city-to-city trip movements), because this was a focus of the model validation effort.

American Traveler Survey (ATS)

The American Travel Survey (ATS), developed and conducted by the Bureau of Transportation Statistics (BTS) in 1995, obtained information about long-distance travel of persons living in the United States. The information was used to identify characteristics of current use of the nation's transportation system, forecast future demand, analyze alternatives for investment in and development of the system, and assess the effects of Federal legislation and Federal and state regulations on the transportation system and its use.

We processed the ATS to extract intra-California trips that were over 100 miles in length (consistent with our long trip definition), and converted these trips from 1995 annual trips to 2000 daily trips using a growth factor of 6.9 percent (based on population growth in California during this time) and a annualization factor of 365 days per year. The subsequent average daily trips were segmented by trip purpose and market in Table 2.1. Commute trips were excluded from this analysis, since they were derived from the CTPP data.

Table 2.1 Average Daily Interregional Trips in the American Traveler Survey Over 100 Miles (Long)

	Business	Recreation	Other	Total
LA to Sacramento	5,169	7,127	1,467	**13,764**
LA to San Diego	10,313	61,763	13,567	**85,642**
LA to SF	17,356	44,108	6,787	**68,251**
Sacramento to SF	5,645	21,443	7,306	**34,394**
Sacramento to San Diego	1,227	1,227	218	**2,672**
San Diego to SF	5,966	16,443	2,258	**24,667**
LA/SF to SJV	4,396	19,777	5,690	**29,863**
Other to SJV	12,538	12,886	4,725	**30,150**
To/from Monterey/ Central Coast	8,271	19,829	6,796	**34,895**
To/from Far North	3,129	12,359	2,366	**17,854**
To/from W. Sierra Nevada	531	7,528	1,510	**9,570**
Total	**74,540**	**224,491**	**52,691**	**351,722**

Source: U.S. Department of Transportation Bureau of Transportation Statistics, *1995 American Traveler Survey, Technical Documentation*, http://www.bts.gov/publications/1995_american_travel_survey/index.html.

One problem with the ATS data is that trips are only recorded to and from standard Metropolitan Statistical Areas (MSAs). Trips that are not destined or originating from an MSA in California are coded as "not within an MSA." These trips were not included in the survey data summaries. Instead, trips within the regions in the statewide model that did not correspond with a MSA were obtained from the California Department of Transportation (Caltrans) Household Travel Survey, described below.

The ATS data also provided mode shares for the business, recreation, and other long trip purposes. These are presented in Table 2.2.

Table 2.2 Mode Shares in the American Traveler Survey Over 100 Miles (Long)

Mode	Business	Recreation	Other
Auto	76.13%	87.84%	87.98%
Rail	0.70%	2.32%	3.27%
Air	23.17%	9.85%	8.75%

Source: U.S. Department of Transportation Bureau of Transportation Statistics, *1995 American Traveler Survey, Technical Documentation*, http://www.bts.gov/publications/1995_american_travel_survey/index.html.

Caltrans Household Travel Survey

The California Statewide Travel Survey was conducted in 2000 to 2001 for weekday travel.[2] This survey was an activity-based survey and included all in-home activities and travel completed in accessing activity locations over a 24-hour period. The survey of 17,040 households was conducted in each of the 58 counties throughout the State. The survey reported 8.6 total trips per household.

The survey was conducted by NuStats Research and Consulting, who surveyed randomly selected households using the telephone recruitment/diary mail-out/telephone trip retrieval method. These data were used in this study as disaggregate data, so expansion and adjustment factors developed for the survey were not utilized. This includes adjustment factors developed from Global Positioning System (GPS) surveys conducted to identify trip under-reporting; and those developed to account for changes in travel behavior due to the September 11, 2001, attacks on the World Trade Center and Pentagon, which severely disrupted travel throughout the U.S. The survey was conducted in waves, with the fall 2000 and spring 2001 waves completed before 9/11 and the fall 2001 wave completed before and after 9/11.

Table 2.3 presents a summary of the Caltrans household travel survey, weighted and summarized for interregional travel. Several markets are too long to have any short trips (under 100 miles), but many markets are close enough to have both short and long trips (such as Los Angeles to San Diego).

[2] State of California, Department of Transportation, Division of Transportation System Information, Office of Travel Forecasting and Analysis, Statewide Travel Analysis Branch, *2000-2001 California Statewide Travel Survey Weekday Travel Report*, June 2003.

Table 2.3 Average Daily Interregional Trips in the Caltrans Household Travel Survey Less Than 100 Miles (Short)

	Business	Other	Recreation	Total
LA to Sacramento		–	–	**–**
LA to San Diego	19,244	42,340	27,512	**89,095**
LA to SF				**–**
Sacramento to SF	17,805	17,383	12,394	**47,582**
Sacramento to San Diego	–	–	–	**–**
San Diego to SF	–	–	–	**–**
LA/SF to SJV	11,769	16,565	25,518	**53,852**
Other to SJV	20,223	24,382	8,341	**52,946**
To/from Monterey/ Central Coast	16,351	44,784	67,024	**128,159**
To/from Far North	15,626	47,494	89,480	**152,599**
To/from W. Sierra Nevada	2,421	10,566	6,840	**19,827**
Total	**103,439**	**203,514**	**237,108**	**544,061**

Source: State of California, Department of Transportation, Division of Transportation System Information, Office of Travel Forecasting and Analysis, Statewide Travel Analysis Branch, *2000-2001 California Statewide Travel Survey Weekday Travel Report*, June 2003.

The California Statewide Travel Survey data also provided mode shares for the business, recreation, and other short trip purposes. These are presented in Table 2.4.

Table 2.4 Mode Shares in the Caltrans Household Travel Survey Less Than 100 Miles (Short)

Mode	Business	Recreation	Other
Auto	92.89%	99.28%	89.60%
Rail	0.11%	0.72%	8.35%
Air	7.00%	0.00%	2.05%

Source: State of California, Department of Transportation, Division of Transportation System Information, Office of Travel Forecasting and Analysis, Statewide Travel Analysis Branch, *2000-2001 California Statewide Travel Survey Weekday Travel Report*, June 2003.

Census Transportation Planning Package (CTPP)

The Census Transportation Planning Package (CTPP) is a set of special tabulations from the decennial census designed for transportation planners. The CTPP contains tabulations by place of residence, place of work, and for flows between home and work. CTPP is a cooperative effort sponsored by the State Departments of Transportation (DOT) under a pooled funding arrangement with the American Association of State Highway and Transportation Officials (AASHTO). The data are tabulated from answers to the Census 2000 long form questionnaire, mailed to one in six U.S. households. Because of the large sample size, the data are reliable and accurate. CTPP provides comprehensive and cost-effective data, in a standard format, across the United States.

The CTPP was collected in 2000 for the MPOs in the State of California and summarized for use in this project for commute travel, and for both long and short trips. Table 2.5 presents a summary of the CTPP data, weighted and summarized for both long and short interregional commute travel.

Table 2.5 Average Daily Commute Interregional Trips in the Census Transportation Planning Package

	Short Commute	Long Commute	Total
LA to Sacramento	–	5,103	**5,103**
LA to San Diego	69,728	29,665	**99,393**
LA to SF	–	22,124	**22,124**
Sacramento to SF	37,192	16,986	**54,178**
Sacramento to San Diego	–	886	**886**
San Diego to SF	–	4,840	**4,840**
LA/SF to SJV	77,112	53,741	**130,853**
Other to SJV	128,792	10,950	**139,743**
To/from Monterey/Central Coast	96,448	28,809	**125,257**
To/from Far North	36,658	16,982	**53,640**
To/from W. Sierra Nevada	17,672	9,730	**27,402**
Total	**463,603**	**199,817**	**663,420**

Source: U.S. Department of Transportation, Federal Highway Administration, Census Transportation Planning Package, September 11, 2006, http://www.fhwa.dot.gov/ctpp/.

The CTPP data also provided mode shares for the commute trip purposes (long and short). These are presented in Table 2.6. The CTPP included air, walk, bike, school bus, and other modes in an "other" mode category, which we assumed to be primarily air for interregional trips.

Table 2.6 Mode Shares in the in the Census Transportation Planning Package

Mode	Commute Long	Commute Short
Auto	99.29%	99.52%
Rail	0.71%	0.48%
Air	0.00%	0.00%

Source: State of California, Department of Transportation, Division of Transportation System Information, Office of Travel Forecasting and Analysis, Statewide Travel Analysis Branch, *2000-2001 California Statewide Travel Survey Weekday Travel Report*, June 2003.

2.2 AIR PASSENGERS

The U.S. DOT Federal Aviation Administration (FAA) origin-destination (O&D) 10-percent sample database includes actual ticket information for 10 percent of the tickets collected by large air carriers. While the 10-percent ticket sample data represents a robust data of airfares and travel times, these data are subject to sampling error. In addition, the O&D databases generally will not include tickets for passengers with itineraries that begin on airlines classified by the FAA as "Small Certificated Air Carriers," those airlines who do not fly any planes with more than 60 seats.

Despite the limitations of the data, the O&D database is probably the most accurate single source for defining intrastate air markets. These data are more accurate for larger air markets, where there are few, if any, Small Certificated Air Carriers. During model validation, we uncovered a discrepancy between the air demand data in the ATS data and the air demand data in the FAA data for California. The ATS data for air travel in California reported 62,069 air trips and the FAA data reported only 48,246 for year 2000, as shown in Table 2.7. In addition, the FAA data for 2005 shows a significant decline in the observed volumes; these also are reported in Table 2.7. In an effort to accommodate the difference in observed data sources, a new validation target of 55,158 air trips was chosen and these additional air trips were allocated proportionally to each market that increased from 2000 to 2005. Markets that decreased from 2000 to 2005 were held constant in the new validation targets. Flights per day are also estimated for the FAA data, based on the amount of service reported in the FAA 10-percent ticket sample data.

Table 2.7 Air Passenger Boardings for 2000 by Market

	Observed Average Daily Volumes				Passengers per Flight
	2000	2005	2000 Adjusted	Flights Per Day	2000 Adjusted
LA to Sacramento	7,182	7,410	12,308	123	100
LA to San Diego	387	113	387	47	8
LA to SF	29,329	22,990	29,329	455	64
Sacramento to SF	5	8	8	15	1
Sacramento to San Diego	2,246	2,507	3,848	39	99
San Diego to SF	8,096	6,697	8,096	120	68
LA/SF to SJV	82	163	140	81	2
Other to SJV	64	54	64	32	2
To/from Monterey/ Central Coast	596	265	596	162	4
To/from Far North	170	221	292	56	5
To/from W. Sierra Nevada		-	-	–	
Intraregion	88	21	88	23	4
Total	**48,246**	**40,449**	**55,158**	**1,152**	**48**

Source: U.S. Department of Transportation O&D Market Database obtained from the Bureau of Transportation Statistics web site, accessed October 2005.

2.3 RAIL PASSENGERS

Rail passenger data was obtained from interregional rail operators in California and from MPOs in the State for intraregional area rail travel. The data have been aggregated for each urban area and for each interregional rail market. These data were compiled for all rail operators in California, as shown in Table 2.8. The allocation of rail boardings to interregional and intraregional for the San Francisco Bay Area is based on estimates provided by the MTC. The interregional rail line in the Los Angeles region is the Metrolink Orange County line (from Los Angeles Union Station to Oceanside in San Diego County), and was estimated based on local knowledge at 600 boardings out of a total of 5,600 boardings for the line.

Table 2.8 Rail Passengers in 2000 by Operator and Route

Operator/Route	Market Served	Boardings	Intraregional	Interregional
Amtrak Capital Corridor	Sacramento to San Francisco	3,300	1,000	2,300
Amtrak Surfliner	Santa Barbara to San Diego	5,100	2,800	2,300
Amtrak San Joaquin	San Joaquin Valley to San Francisco	2,110	100	2,010
Altamont Commuter Express (ACE)	Stockton to San Jose	3,100	700	2,400
Coaster, San Diego Trolley	San Diego region	97,400	97,400	
Metrolink, Metro Rail	Los Angeles region	236,500	235,900	600
BART, Caltrain, SF Muni, SCVTA	San Francisco region	555,900	555,900	
Regional Transit LRT	Sacramento region	37,600	37,600	
Total		**941,010**	**931,400**	**9,610**

Source: Individual rail operator and Metropolitan Planning Organization data sources reported in Cambridge Systematics, Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study, Socioeconomic Data, Transportation Supply, and Base Year Travel Patterns Data, December 2005.

The observed rail data showed a similar discrepancy between the ATS demand for rail travel and the aggregated rail boardings by operator for interregional travel. The ATS rail demand data resulted in 13,275 passenger trips and the summation of the rail passenger boardings by operator resulted in 7,560 passenger trips. This represents only 57 percent of total rail demand reported in the ATS data. This would indicate a much higher percent of interregional boardings on interregional rail routes than is assumed in the current estimates.

2.4 Highway Volumes

Highway traffic counts were obtained primarily from the Caltrans traffic count database and from the MTC and the Southern California Association of Governments (SCAG) traffic count databases. Sacramento and San Diego urban area traffic count databases were not required since the Caltrans traffic count data has sufficient locations in these regions, and because the networks were largely compatible with the Caltrans database rather than the MPO databases. At the time of this report, the SCAG traffic count database was not available and was, therefore, not included in these summaries. Table 2.9 summarizes the highway traffic counts by facility type. Table 2.10 presents the same information by area type.

Table 2.9 Average Daily Traffic Count Miles Traveled by Facility Type

Facility Type	Number of Count Locations	Count Miles Traveled
Freeway	517	41,344,381
Expressway	638	14,322,157
Major Arterial	179	3,764,260
Minor Arterial	17	120,794
Collector	8	28,199
Total	**1,359**	**59,579,791**

Source: Caltrans Traffic Count Database – CA_ValVol(statewide model 2000 counts).dbf with 1,191 locations; Metropolitan Transportation Commission 2000 model validation counts with 175 locations; and Sacramento Area Council of Governments 2000 model validation counts with 4 locations.

Table 2.10 Average Daily Traffic Count Miles Traveled by Area Type

Facility Type	Number of Count Locations	Count Miles Traveled
Rural	836	28,096,076
Suburban	133	4,784,532
Urban	390	26,699,182
Total	1,359	59,579,791

Source: Caltrans Traffic Count Database – CA_ValVol(statewide model 2000 counts).dbf with 1,191 locations; Metropolitan Transportation Commission 2000 model validation counts with 175 locations; and Sacramento Area Council of Governments 2000 model validation counts with 4 locations.

The primary highway validation test is the comparison of traffic counts and modeled volumes at critical gateways in the system. The gateways correspond to the air and rail markets of consideration. Table 2.11 presents a list of these gateways and the average daily traffic counts available for validation.

Table 2.11 Average Daily Traffic Counts for Gateways between California Cities

Gateway	Routes Included	Average Daily Traffic Count
Sacramento to San Francisco	I-80	115,536
Sacramento to San Joaquin Valley	I-5 SR 99	109,365
San Joaquin Valley to San Francisco (Altamont Pass)	I-580 SR 205	111,500
San Joaquin Valley to San Francisco (Pacheco Pass)	SR 152	20,728
San Joaquin Valley to Los Angeles (The Grapevine or Tejon Pass)	I-5 SR 14	78,927
Los Angeles to San Diego	I-5 I-15	442,951
Total		879,007

Source: Caltrans Traffic Count Database – CA_Screens.dbf with 76 locations.

3.0 Trip Frequency Model Calibration

3.1 Interregional Trips

Interregional trips are calibrated by trip purpose (business, commute, recreation, and other) and by distance class (short and long); and by major metropolitan areas (Sacramento Area Council of Governments (SACOG), MTC, SCAG, and San Diego Association of Governments (SANDAG)). These provide the detail needed by the subsequent models for trip purpose and distance class, and some assurance that the four major metropolitan areas are accurately producing interregional trips. The observed trips for the trip frequency model are derived from a combination of the three surveys described in Section 2.0: 1) ATS, 2) the Caltrans Household Travel Survey, and 3) CTPP.

Table 3.1 presents the results of the trip frequency model calibration effort for short trips (less than 100 miles), and Table 3.2 presents the results of the trip frequency model calibration effort for long trips (more than 100 miles). The majority of short interregional trips are generated outside the four largest regions; whereas, the majority of long interregional trips are generated within the four largest regions. This is largely due to the fact that the majority of short interregional trips are destined for the four largest regions, and the majority of long interregional trips are traveling between major metropolitan regions.

Table 3.1 Trip Frequency Model Results for Short Trips

Region	Short				Total Daily Model Trips	Total Daily Observed Trips	Percent Difference
	Commute	Business	Recreation	Other			
Sacramento Region (SACOG)	43,450	11,108	11,124	17,864	83,546	83,075	1%
San Diego Region (SANDAG)	28,945	13,763	8,148	8,304	59,160	58,796	1%
San Francisco Region (MTC)	38,142	20,641	25,214	15,620	99,617	98,872	1%
Los Angeles Region (SCAG)	54,908	9,420	36,691	40,338	141,357	140,431	1%
Remainder of CA	298,252	48,577	122,876	154,689	624,394	627,536	-1%
Total	**463,697**	**103,509**	**204,053**	**236,815**	**1,008,074**	**1,008,710**	**0%**

Table 3.2 Trip Frequency Model Results for Long Trips

Region	Long				Total Daily Model Trips	Total Daily Observed Trips	Percent Difference
	Commute	Business	Recreation	Other			
Sacramento Region (SACOG)	18,192	6,204	15,784	5,050	45,230	44,271	2%
San Diego Region (SANDAG)	21,738	6,264	21,533	6,976	56,511	55,671	2%
San Francisco Region (MTC)	15,800	8,359	96,235	16,269	136,663	132,131	3%
Los Angeles Region (SCAG)	48,715	23,008	54,771	15,644	142,138	140,818	1%
Remainder of CA	82,925	19,530	15,217	1,202	118,874	131,937	-10%
Total	**187,370**	**63,365**	**203,540**	**45,141**	**499,416**	**504,828**	**-1%**

Table 3.3 presents the alternative-specific constants estimated during the model calibration process by trip purpose, distance class, and metropolitan area. Generally, the size and sign of the constants are reasonable. The large negative constants on interregional trips indicate that, all things being equal, people would prefer to travel within their own region. Commute trips are the least negative, indicating that people are more likely to commute outside their region than to travel for other purposes. Other trips have the largest negative constants for long trips, indicating that people are least likely to travel outside their region for other trips compared to other trip purposes. The positive constants on long recreation and other trips for metropolitan areas indicate that more long recreation and other trips are generated in major metropolitan areas than for other parts of the State.

Table 3.3 Trip Frequency Model Alternative-Specific Constants

	Commute	Business	Recreation	Other
Long Trips				
Sacramento Region (SACOG)	0.0034	0.2268	1.8168	4.0777
San Diego Region (SANDAG)	-0.4265	-0.2669	0.9692	3.3428
San Francisco Region (MTC)	-1.4598	-0.7273	2.9772	4.6439
Los Angeles Region (SCAG)	-1.0001	-0.3207	1.3726	3.6461
1 trip per day	-2.6718	-4.6121	-4.4763	-8.4643
2 trips per day	-4.1080	-5.2482	-6.0397	-9.7942
Short Trips				
Sacramento Region (SACOG)	-0.8145	-0.6594	-2.3856	-3.2270
San Diego Region (SANDAG)	-1.6807	-0.1952	-1.6738	-1.0711
San Francisco Region (MTC)	-2.2370	-0.9736	-1.8703	-3.3796
Los Angeles Region (SCAG)	-2.4393	-2.0460	-0.8903	-0.4989
1 trip per day	-3.0659	-4.5928	-2.9514	-3.7812
2 trips per day	-3.8932	-5.1604	-3.8573	-4.5585

3.2 Intraregional Trips

The California Statewide High-Speed Rail Model does not model intraregional trips from urban areas explicitly, rather it relies on existing MPO models in the four major metropolitan areas to provide intraregional trips directly. These trips are included in the model during trip assignment as either auto vehicle or transit person trips. As a result, we do not maintain tabulations of total person trips from the MPO models. Nonetheless, it is useful to compare trip generation parameters from these MPO models and check for reasonableness. In addition, we have derived intraregional trips from the Caltrans Statewide Model to represent all other regions in the State beyond the four largest MPO regions. This allows the intraregional trip table to be more comprehensive statewide. Table 3.4 presents the auto vehicle trips (as the best proxy for total trips) from each of the four MPO models, and the resulting trips per person and trips per employee statistics from these. In general, these trip rates are quite consistent across the MPO regions, with one exception. SANDAG reports significantly higher trips per person and trips per employee than other regions. Based on conversations with SANDAG staff, this is because they are accounting for significant under-reporting evidenced on their household travel survey upon which the trip generation model was based. Overall, there are 65 million intraregional auto vehicle trips included in the California Statewide High-Speed Rail model.

Table 3.4 Intraregional Auto Vehicle Trips

Region	Daily Auto Vehicle Trips	Population	Trips Per Person	Employment	Trips Per Employee
SCAG	34,673,468	15,101,248	1.98	7,406,280	4.69
SANDAG	5,875,971	2,585,247	2.05	1,168,880	5.03
MTC	14,460,747	6,376,956	2.05	3,753,533	3.85
Remaining	13,045,337	6,717,328	1.75	3,107,079	4.20
Total	**68,055,523**	**30,780,779**	**1.95**	**15,435,772**	**4.41**

4.0 Destination Choice Model Calibration

4.1 INTERREGIONAL TRIPS

Destination choice models were calibrated to both regions and to significant travel markets in the State. The observed dataset was developed from the three observed travel surveys presented in the previous section. There were alternative-specific constants for each region in the State, but additional constants on significant travel markets were only included for the largest travel markets. There were 14 regions included in the calibration and six major travel markets. The regions identified in the model estimation of destination choice are shown in Figure 4.1.

Figure 4.1 Destination Choice Model Regions

The major travel markets were included by direction representing 12 additional constants:

- Los Angeles (SCAG) region to Sacramento (SACOG) region;
- Los Angeles (SCAG) region to San Diego (SANDAG) region;
- Los Angeles (SCAG) region to San Francisco (MTC) region;
- Sacramento (SACOG) region to San Francisco (MTC) region;
- Sacramento (SACOG) region to San Diego (SANDAG) region; and
- San Diego (SANDAG) region to San Francisco (MTC) region.

In addition to the six major travel markets, the model calibration results are reported for the following five travel markets:

- Los Angeles (SCAG) region and San Francisco (MTC) region to the San Joaquin Valley;

- All other regions to the San Joaquin Valley;
- To/from the Monterey (AMBAG) region and the Central Coast;
- To/from the Far North region; and
- To/from the W. Sierra Nevada region.

The first six travel markets in this list represent the primary travel markets of interest to the high-speed rail study. The additional travel markets are included to ensure that other regions in the State are attracting approximately the right number of trips. The San Francisco (MTC) region includes the nine counties: Napa, Sonoma, Marin, Solano, Contra Costa, Alameda, San Francisco, San Mateo, and Santa Clara. The Los Angeles (SCAG) region includes six counties: Ventura, Los Angeles, San Bernadino, Riverside, Orange, and Imperial.

The results of the destination choice model calibration are provided in Table 4.1. The destination choice model results in modeled trips in each market within +/-10 percent of observed, except for the Sacramento to San Diego market, which has a very small total number of observed trips per day(2,082).

Table 4.1 Destination Choice Model Results for Short and Long Trips

Region	Short				Long				Total Daily Model Trips	Total Daily Observed Trips
	Commute	Business	Recreation	Other	Commute	Business	Recreation	Other		
LA to Sacramento	0	0	0	0	4,987	2,093	4,063	1,271	12,414	11,568
LA to San Diego	60,682	16,518	37,229	22,594	29,009	10,660	66,529	19,715	262,936	271,100
LA to SF	0	0	0	0	16,231	7,865	26,210	4,592	54,898	50,070
Sacramento to SF	34,908	18,494	14,734	9,990	16,299	6,775	31,373	7,007	139,580	143,563
Sacramento to San Diego	0	0	0	0	1,041	307	1,280	405	3,033	2,082
San Diego to SF	0	0	0	0	4,456	1,351	7,794	1,338	14,939	15,180
LA/SF to SJV	78,538	14,383	15,133	23,847	38,124	12,186	23,967	3,346	209,524	217,987
Other to SJV	119,756	21,268	55,760	69,307	12,860	3,290	57	39	282,337	228,384
To/From Monterey/Central Coast	101,108	16,204	38,816	45,565	35,188	10,739	27,953	4,858	280,431	295,294
To/From Far North	45,520	12,941	33,172	56,011	22,659	6,143	9,289	1,792	187,527	222,350
To/From W. Sierra Nevada	23,185	3,701	9,209	9,501	6,516	1,956	5,025	778	59,871	55,962
Total	**463,697**	**103,509**	**204,053**	**236,815**	**187,370**	**63,365**	**203,540**	**45,141**	**1,507,490**	**1,513,540**

The destination choice model was calibrated first to regions, and then to major travel markets. The alternative-specific constants for these regions are presented in Table 4.2 for each destination choice model. These constants are generally of the right sign and size for each region, based on judgment about a region's attractiveness for a particular trip type. For example, the Los Angeles (SCAG) region has very high negative constants for short commute trips, because the SCAG region is so large that commuting within the region is much more likely. Both the San Francisco (MTC) and Los Angeles (SCAG) regions have a large positive constant for long recreation and other trips, indicating that these regions are more likely to be tourist and other destinations for interregional travel than other regions. These were constrained to 5.0 during model validation because the model overpredicted long recreation and other trips to the MTC and SCAG regions in future years.

Table 4.2 Destination Choice Alternative-Specific Constants for Regions

	Short Trips				Long Trips	
	Business	Commute	Recreation	Other	Business/ Commute	Recreation /Other
AMBAG	-0.2445	-5.7298	5.3663	6.9090	-0.2418	0.1833
Central Coast	-2.5528	-11.1363	-4.1681	-0.4686	-0.2546	1.3342
Far North	4.2944	0.8053	11.1214	15.8674	-1.7279	-0.8390
Fresno/Modesto	-0.4407	-7.2717	2.2259	4.7980	-0.6854	-0.1504
Kern	0.2741	-12.2410	-5.4572	-0.5856	0.4764	0.5223
Merced	-1.4348	-7.2677	2.3322	2.3068	-0.8552	-0.0942
South San Joaquin	-0.0078	-2.1527	3.9379	3.9476	-0.1435	0.5465
SACOG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SANDAG	-3.1823	-13.2300	-3.5181	-2.1712	-5.0724	-4.3954
San Joaquin	0.5557	0.4741	4.4123	4.9147	-0.1083	-0.3754
Stanislaus	0.2438	-0.3516	4.8938	4.1515	-1.0433	-1.4260
West Sierra Nevada	1.6340	0.3857	5.2839	4.6007	-0.1343	0.4070
Alameda County	-0.2746	0.8163	1.6012	2.1743	-0.6781	5.0000
Contra Costa County	0.2653	1.2544	2.2944	2.3108	0.2262	5.0000
Marin, Napa, Solano Counties	0.1175	1.1294	2.8305	1.1660	0.1486	5.0000
San Francisco County	-0.1086	0.4466	0.8779	1.1404	-0.8474	5.0000
San Mateo County	-0.0096	0.9610	1.2878	1.5877	-0.6874	5.0000
Santa Clara County	-0.2444	0.3245	2.2959	2.0104	-0.7104	5.0000
Solano County	-0.2181	1.4534	1.5247	2.3977	0.8002	5.0000
Imperial County	-2.2261	-9.2739	4.2654	4.5493	-1.8101	5.0000
Los Angeles County	-3.6169	-10.9905	2.9308	2.6648	-2.9451	5.0000
Orange County	-3.1387	-1.8747	-1.2074	-2.2575	0.0963	5.0000
Riverside County	-3.7639	-9.9196	2.4380	2.4556	-4.4162	5.0000
San Bernardino County	-2.2261	-9.2739	3.2743	4.4368	-3.8305	5.0000
Ventura County	-3.0721	-9.4051	3.6632	3.7485	-3.0011	5.0000

The destination choice model also includes alternative-specific constants for major travel markets. Two of these markets are dominated by short trips and the remaining four markets are for long trips, as listed below.

- San Francisco (MTC) to Los Angeles (SCAG) – long trips;
- San Francisco (MTC) to San Diego (SANDAG) – long trips;
- Sacramento (SACOG) to Los Angeles (SCAG) – long trips;
- Sacramento (SACOG) to San Diego (SANDAG) – long trips;
- Sacramento (SACOG) to San Francisco (MTC) – short and long trips; and
- Los Angeles (SCAG) to San Diego (SANDAG) – short and long trips.

The two short trip markets do contain both short and long trips, because there are parts of each region that are more than 100 miles apart. Table 4.3 presents the alternative-specific constants for the six major travel markets by trip purpose and distance class. Of the four long distance travel markets, the Los Angeles (SCAG) region to San Francisco (MTC) region is by far the largest market, as expected. The large negative constant for long recreation and other trips in the model is necessary to counteract the tendency of the model to attract more trips to this market than is observed, based solely on the size and attractiveness of these markets. This was constrained during model validation. The large positive constant for the Sacramento (SACOG) region to San Diego (SANDAG) region is needed to increase the small numbers of trips in this market to match observed. This constant also was constrained during model validation. The large positive constant for long recreation/other trips from the Los Angeles (SCAG) region to the San Diego (SANDAG) region is primarily to reflect the fact that there are more long distance recreation trips in this market than short distance trips. Recreation trips are often not based on shortest time and distance parameters, since they are destined for a particular destination regardless of distance.

Table 4.3 Destination Choice Alternative-Specific Constants for Travel Markets

	Short				Long	
Travel Market	Commute	Business	Recreation	Other	Commute/ Business	Recreation/ Other
MTC-SCAG	0.00	0.00	0.00	0.00	-1.12	-6.40
MTC-SANDAG	0.00	0.00	0.00	0.00	1.14	3.19
SACOG-SCAG	0.00	0.00	0.00	0.00	-1.74	-1.57
SACOG-SANDAG	0.00	0.00	0.00	0.00	0.37	8.00
SCAG-MTC	0.00	0.00	0.00	0.00	-1.12	-6.40
SCAG-SACOG	0.00	0.00	0.00	0.00	-1.74	-1.57
SANDAG-MTC	0.00	0.00	0.00	0.00	1.14	3.19
SANDAG-SACOG	0.00	0.00	0.00	0.00	0.37	8.00
MTC-SACOG	-0.47	2.70	7.14	10.368	0.77	0.75
SACOG-MTC	-0.47	2.70	7.14	10.37	0.77	0.75
SCAG-SANDAG	0.10	-1.08	0.75	-2.36	5.40	7.73
SANDAG-SCAG	0.10	-1.08	0.75	-2.36	5.40	7.73

4.2 Intraregional Trips

Since the California Statewide High-Speed Rail Model does not explicitly model intraregional distribution of trips, there are no validation comparisons made for the distribution models. Since each of the MPO models and the California Statewide Models is validated for trip distribution, these validations are assumed to suffice for the purposes of this project. The following are reference reports for these validations:

- Metropolitan Transportation Commission, *Travel Demand Models for the San Francisco Bay Area (BAYCAST-90)*, Technical Summary, June 1997;
- Cambridge Systematics, *SCAG Travel Model Improvement Program Model Update Documentation*, prepared for the Southern California Association of Governments, July 2005; and
- California Department of Transportation and Dowling Associates, *California Statewide Travel Model Description*, January 20, 2004.

The Sacramento and San Diego urban model files were obtained from these agencies, but model documentation was not available to review, so discussions with their modeling staff ensured that the trip tables were the official, adopted versions as of spring 2006.

5.0 Mode Choice Model Calibration

5.1 Interregional Trips

The mode choice models were a little more complicated to calibrate, since there was conflicting observed data on boardings, highway volumes, and mode shares. The observed mode shares were derived from the same three observed data sources used for trip frequency and destination choice. These observed mode shares were translated into trips by mode and compared to observed boardings by mode for air and rail. The observed mode shares resulted in higher estimates of trips by mode than boardings for both air and rail. Table 5.1 presents a comparison of the observed datasets. In the case of air boardings, an adjusted observed value was derived to account for the under-representation in the FAA dataset for smaller markets. The mode choice calibration targets were then adjusted to match the observed adjusted boardings for air and the observed boardings for rail. The final calibration targets for mode shares are reported in Table 5.2.

Table 5.1 Comparison of Observed Trips by Mode

	Air	Rail
Observed Trips from Travel Survey Data	61,327	16,006
Observed Boardings from Transit Operators	48,246	9,610
Difference	13,081	6,396
Adjusted Observed Boardings	55,156	
Source of Observed Boardings	FAA	Amtrak, ACE, Metrolink

Table 5.2 Observed Main Mode Shares for Calibration

	Short Trips			Long Trips		
Mode	**Business**	**Commute**	**Recreation/ Other**	**Business/ Commute**	**Recreation/ Other**	**Total**
Trips by Mode						
Auto	102,086	461,293	441,190	223,786	220,419	1,448,774
Air	-	-	-	26,139	29,017	55,156
Rail	1,589	2,310	242	932	4,537	9,610
Total	**103,675**	**463,603**	**441,432**	**250,857**	**253,973**	**1,513,540**
Mode Shares						
Car	98.5%	99.5%	99.9%	89.2%	86.8%	95.7%
Air	0.0%	0.0%	0.0%	10.4%	11.4%	3.6%
Rail	1.5%	0.5%	0.1%	0.4%	1.8%	0.6%

Mode shares were calibrated to match these observed mode shares by mode and trip purpose. Table 5.3 presents the results of the mode choice model calibration. Calibration was completed to match mode shares; trips are reported to provide information on these results. The final results are almost exact in total and quite close by mode and purpose.

Table 5.3 Main Mode Choice Model Results

	Short Trips			Long Trips		
Mode	**Business**	**Commute**	**Recreation/ Other**	**Business/ Commute**	**Recreation/ Other**	**Total**
Trips by Mode						
Auto	102,430	459,160	440,563	221,120	218,669	1,441,942
Air				28,754	27,181	55,935
Rail	1,079	4,537	305	861	2,831	9,613
Total	**103,509**	**463,697**	**440,868**	**250,735**	**248,681**	**1,507,490**
Mode Shares						
Car	99.0%	99.0%	99.9%	88.2%	87.9%	95.7%
Air	0.0%	0.0%	0.0%	11.5%	10.9%	3.7%
Rail	1.0%	1.0%	0.1%	0.3%	1.1%	0.6%

The main mode choice model alternative specific constants are presented in Table 5.4. These constants include the wait time and terminal time, which were determined to be the same for each mode based on the evaluation of the level-of-service assumptions.[3] The table includes the actual constant for each mode after accounting for the effects of the wait time and terminal time components. The high-speed rail constants were set based on an analysis of the original high-speed rail constants in the model estimation and the relationship to the air and rail constants by mode and purpose from the calibrated models. For short trips, the high-speed rail constant is similar to the rail constant and for long trips, the high-speed rail constant is between the air and rail constants. The small discrepancy in the high-speed rail constants for short trips (i.e., that they do not match exactly with conventional rail constants) is because the conventional rail constants were revised after the high-speed rail constants were set and the difference was not significant enough to revise the high-speed rail constants. For example, the biggest difference in the high-speed rail constants compared to conventional rail constants was for short business trips, which account for approximately 8 percent of total high-speed rail trips in the future base conditions and so adjustments in the high-speed rail constant to make them more consistent would account for less than a one percent change in overall number of high-speed rail trips, thus the change was not necessary.

[3] Cambridge Systematics, Inc., with Systra Consulting, Inc. and Citilabs, *Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study Levels of Service Assumptions and Forecast Alternatives*, prepared for the Metropolitan Transportation Commission and the California High-Speed Rail Authority, August 2006.

Table 5.4 Main Mode Choice Model Alternative Specific Constants

	Short Trips			Long Trips	
	Business	**Commute**	**Recreation/ Other**	**Business/ Commute**	**Recreation/ Other**
Air Constants					
Calibrated Constant	0.0000	0.0000	0.0000	-10.2689	-4.6833
Wait Time Constant	0.0000	0.0000	0.0000	-1.9734	-1.1715
Terminal Time Constant	0.0000	0.0000	0.0000	-0.7894	-0.4260
Actual Constant	0.0000	0.0000	0.0000	-7.5062	-3.0858
Conventional Rail Constants					
Calibrated Constant	-6.2316	-7.1260	-5.5412	-4.6197	1.2723
Wait Time Constant	-1.5000	-0.7500	-0.4305	-0.5382	-0.3195
Terminal Time Constant	-0.3000	-0.1500	-0.0861	-0.1076	-0.0639
Actual Constant	-4.4316	-6.2260	-5.0246	-3.9738	1.6557
High-Speed Rail Constants					
Calibrated Constant	-7.5296	-6.9635	-5.6853	-6.7570	-0.7132
Wait Time Constant	-1.5000	-0.7500	-0.4305	-0.5382	-0.3195
Terminal Time Constant	-1.0000	-0.5000	-0.2870	-0.3588	-0.2130
Actual Constant	-5.0296	-5.7135	-4.9678	-5.8600	-0.1807
Auto Constant					
Calibrated Constant	0.0000	0.0000	0.0000	0.0000	0.0000

The access and egress models are calibrated separately from the main mode choice models. The observed access and egress trips by mode are presented in Table 5.5. The access and egress mode choice models are calibrated based on mode shares. The access and egress trips were derived from the model estimation dataset and are, therefore, not as accurate in the aggregate as an independent validation data source of trips would be. Nonetheless, this is the only data source available for access and egress trips.

The accuracy of the access and egress models are not as critical to the resulting ridership, because the access and egress models are used solely to provide logsums for access and egress to the main model choice models. As a result, the tolerance levels of accuracy are looser than they are for the main mode choice models. In addition, there are certain levels of detail in the statewide model, such as walk times for larger zones or transit access times, that are not as accurate as would be needed to adequately capture walk access and egress modes. Table 5.6 presented the model results for the access and egress models. The aggregated auto and non-auto access and egress modes are all within +/-14 percent of the observed mode shares. The final calibration was reasonable based on these aggregated comparisons.

Table 5.5 Observed Access and Egress Mode Shares by Mode and Purpose

		Short Trips			Long Trips	
		Business	**Commute**	**Recreation / Other**	**Business/ Commute**	**Recreation / Other**
Drive and park	Access	80.7%	81.8%	52.0%	59.7%	24.1%
	Egress	14.6%	25.9%	33.8%	12.6%	2.3%
Rental car	Access	0.0%	0.0%	0.0%	2.6%	1.3%
	Egress	11.6%	3.2%	33.8%	47.6%	34.4%
Drop off	Access	12.1%	14.8%	38.5%	20.2%	57.4%
	Egress	22.1%	36.8%	0.8%	22.4%	33.1%
Taxi	Access	3.0%	1.8%	5.3%	6.8%	7.9%
	Egress	48.8%	26.4%	26.4%	16.6%	26.3%
Subtotal Auto	**Access**	**95.9%**	**98.4%**	**95.9%**	**89.3%**	**90.7%**
	Egress	**4.1%**	**1.6%**	**4.1%**	**10.7%**	**9.3%**
Transit	Access	3.4%	1.3%	2.9%	8.2%	5.6%
	Egress	2.9%	7.3%	5.2%	0.8%	3.6%
Walk/bike	Access	0.8%	0.3%	1.2%	2.5%	3.7%
	Egress	0.1%	0.5%	0.0%	0.0%	0.3%
Subtotal Non-Auto	**Access**	**97.1%**	**92.3%**	**94.8%**	**99.2%**	**96.1%**
	Egress	**2.9%**	**7.7%**	**5.2%**	**0.8%**	**3.9%**

Table 5.6 Estimated Access and Egress Mode Shares by Mode and Purpose

		Short Trips			Long Trips	
		Business	**Commute**	**Recreation / Other**	**Business/ Commute**	**Recreation Other**
Drive and park	Access	80.3%	60.6%	68.6%	59.5%	52.6%
	Egress	14.6%	25.9%	33.8%	12.6%	2.3%
Rental car	Access	0.0%	0.0%	0.0%	3.4%	3.0%
	Egress	11.6%	3.2%	33.8%	47.6%	34.4%
Drop off	Access	9.0%	22.4%	9.0%	20.0%	28.9%
	Egress	22.1%	36.8%	0.8%	22.4%	33.1%
Taxi	Access	1.8%	1.7%	8.9%	11.2%	7.2%
	Egress	48.8%	26.4%	26.4%	16.6%	26.3%
Subtotal Auto	**Access**	**91.1%**	**84.7%**	**86.5%**	**94.1%**	**91.6%**
	Egress	**8.9%**	**15.3%**	**13.5%**	**5.9%**	**8.4%**
Transit	Access	8.4%	12.9%	13.4%	5.8%	7.4%
	Egress	2.9%	7.3%	5.2%	0.8%	3.6%
Walk/bike	Access	0.5%	2.4%	0.1%	0.0%	1.0%
	Egress	0.1%	0.5%	0.0%	0.0%	0.3%
Subtotal Non-Auto	**Access**	**97.1%**	**92.3%**	**94.8%**	**99.2%**	**96.1%**
	Egress	**2.9%**	**7.7%**	**5.2%**	**0.8%**	**3.9%**

Table 5.7 presents the access and egress mode choice model alternative specific constants. In some cases, these constants are quite large, resulting from small sample sizes. These were constrained to 5.0 so that forecasts would not be unrealistic because of the high constants. We do not envision that constraining these constants is problematic because of the smaller sample sizes for these trip purpose and access and egress mode combinations.

Table 5.7 Access and Egress Mode Choice Model Alternative Specific Constants

		Short Trips		Long Trips		
		Business	Commute	Recreation/ Other	Business/ Commute	Recreation/ Other
Drive and park	Access	4.1656	5.0000	3.2323	4.9231	4.3564
	Egress	-0.6350	-0.7228	5.0000	1.7505	-5.4182
Rental car	Access	0.0000	0.0000	0.0000	-5.5471	-5.0000
	Egress	-0.9882	-5.0000	5.0000	5.9786	1.8267
Drop off	Access	0.0000	0.0000	0.0000	0.0000	0.0000
	Egress	0.0000	0.0000	0.0000	0.0000	0.0000
Taxi	Access	-1.6820	-4.1039	-0.0244	1.7710	-2.1553
	Egress	4.6531	-1.4252	5.0000	5.0000	1.0547
Transit	Access	5.0000	5.0000	1.0523	4.3900	-1.9075
	Egress	5.0000	5.0000	5.0000	5.0000	-3.6551
Walk/bike	Access	5.0000	5.7962	1.3905	5.0000	4.6959
	Egress	5.0000	5.0000	5.0000	5.0000	3.0764

5.2 Intraregional Trips

There are three intraregional models that provide mode choice inputs to the statewide model – MTC, SCAG, and SANDAG. The MTC model has recently undergone additional detailed mode choice model validation as part of the TransBay Study and refinements to the transit and highway assignment validation were completed in the spring of 2007. Results of the MTC mode choice model validation are presented in Table 5.8. This shows a close fit to observed trips by mode overall.

Table 5.8 Intraregional Trips by Mode from MTC Model

Mode	Observed Mode Share	Observed Trips	2000 Model Mode Share	Model Trips
Drive Alone	52.6%	9,158,155	52.7%	9,173,350
Shared Ride 2	16.0%	2,791,131	16.1%	2,799,465
Shared Ride 3+	14.3%	2,481,227	14.3%	2,487,932
BART	1.9%	338,618	2.0%	356,547
Commuter Rail	0.5%	79,081	0.5%	80,449
LRT	0.5%	85,113	0.5%	91,266
Express Bus	0.5%	83,027	0.3%	56,345
Local Bus	2.4%	410,690	2.4%	418,297
Ferry	0.1%	20,968	0.1%	14,259
Walk/Bike	11.2%	1,952,600	11.1%	1,937,434
Total	**100.0%**	**17,400,610**	**100.0%**	**17,415,344**

A SCAG mode choice model was developed for this study to include in the statewide model. This SCAG mode choice model uses SCAG trip tables and skims and a recalibrated version of the MTC mode choice model to produce peak and offpeak trips by mode and purpose for the SCAG region. This model was calibrated to match observed SCAG trips by mode and purpose. The results of this calibration is provided in Table 5.9. This shows a close fit to observed trips by mode overall, but an underestimation of the shared ride 2 trips and an overestimation of drive-alone trips. The transit modes are well validated and so this discrepancy in the auto vehicle trips is not as much of a concern.

Table 5.9 Intraregional Trips by Mode from SCAG Model

Mode	Observed Mode Share	Observed Trips	2000 Model Mode Share	Model Trips
Drive Alone	46.2%	18,039,255	54.9%	21,466,448
Shared Ride 2	21.6%	8,423,944	11.8%	4,593,150
Shared Ride 3+	21.3%	8,332,239	22.5%	8,792,319
Urban Rail	0.3%	104,394	0.3%	104,201
Commuter Rail	0.1%	34,227	0.1%	34,819
Express Bus	0.2%	95,496	0.2%	96,266

Local Bus	1.6%	634,142	1.7%	664,577
Walk/Bike	8.8%	3,422,911	8.5%	3,335,080
Total	**100.0%**	**39,086,607**	**100.0%**	**39,086,859**

The SANDAG trips by mode were not available from existing sources, but the highway and transit assignment validations were available from the Addendum to the Transportation Model Documentation (June 2005). These are presented in Table 5.10.

Table 5.10 Intraregional Volumes by Mode from SANDAG Model

Volume	Mode	Observed	2000 Model	Difference	Percent Difference
Vehicle Miles Traveled	Highway	70,789,214	70,266,732	(522,482)	-1%
Boardings	Rail	99,906	102,052	2,146	2%
Boardings	Bus	229,369	224,161	(5,208)	-2%

6.0 Trip Assignment

There are three individual trip assignments by mode to complete the statewide model validation effort for year 2000. Each assignment is compared to observed data sources, described in Section 2. The highway and rail assignments include interregional and intraregional trips; the air assignment includes only interregional trips because there are no intraregional air trips.

6.1 TRIP TABLES

Trips by mode from the interregional models are combined with intraregional trips by mode to assign to the highway, air, and rail networks. Table 6.1 presents a summary of the 2000 interregional trips by mode and market.

Table 6.1 2000 Interregional Trips by Mode

Market	Auto	Air	Rail	Total
LA to Sacramento	7,479	4,935	-	12,414
LA to San Diego	257,441	100	5,395	262,936
LA to SF	28,031	26,867	-	54,898
Sacramento to SF	137,739	25	1,816	139,580
Sacramento to San Diego	175	2,858	-	3,033
San Diego to SF	4,630	10,309	-	14,939
LA/SF to SJV	205,205	3,393	926	209,524
Other to SJV	281,750	243	344	282,337
To/From Monterey/ Central Coast	275,794	3,532	1,105	280,431
To/From Far North	184,506	3,005	16	187,527
To/From W. Sierra Nevada	59,192	668	11	59,871
Total	**1,441,942**	**55,935**	**9,613**	**1,507,490**

The air trips in this summary are assigned to direct flights across the State of California. It is assumed that transferring to travel within the State is negligible, so the total boardings on air are equal to the total air trips. For rail, there is the option to transfer from one rail line to another and the resulting boardings reflect the number of transfers (1.3 boardings per transfer).

Highway trips are converted from person trips to vehicle trips using vehicle occupancy factors derived from the Caltrans Statewide Travel Survey. These are presented in Table 6.2.

Table 6.2 2000 Interregional Vehicle Occupancy (Persons per Vehicle)

Trip Type	Business	Commute	Recreation	Other
Long	1.1872	1.1118	1.7304	1.3107
Short	1.1807	1.1872	1.4946	1.536

In addition, highway trips are separated into peak and offpeak time periods so that peak and offpeak trip tables can be assigned separately to the highway network. This ensures that peak-period travel times will more accurately reflect congestion that occurs in the peak-period. Table 6.3 presents the time period factors applied by trip purpose.

Table 6.3 2000 Interregional Peaking Factors

Trip Type	Business	Commute	Recreation	Other
Peak from Home	46%	49%	39%	43%
Peak to Home	34%	34%	39%	39%
Offpeak from Home	4%	1%	12%	7%
Offpeak to Home	16%	17%	11%	12%

Following the development of peak and offpeak auto vehicle interregional trips, these are combined with the auto vehicle intraregional trips. These intraregional trips come from four sources: MTC, SANDAG, SCAG, and Caltrans. The Caltrans Statewide Model is used to estimate intraregional trips for all the other regions (except MTC, SANDAG, and SCAG) so that the auto trip table will be representing all statewide travel. This ensures that congestion within each smaller urban area is adequately represented. Table 6.4 summarizes the auto vehicle trips from each source and provides the resulting total peak and offpeak auto vehicle trips that are assigned to the highway network.

Table 6.4 2000 Auto Vehicle Trips by Mode and Source

Region and Mode	Vehicle Trips
MTC Drive Alone	9,173,350
MTC Shared Ride 2	2,799,465
MTC Shared Ride 3	2,487,932
MTC Trucks	252,577
SANDAG Peak	2,852,350
SANDAG Offpeak	3,023,621
SCAG Drive Alone Peak	12,568,822
SCAG Shared Ride 2 Peak	3,118,167
SCAG Shared Ride 3 Peak	1,922,152
SCAG Drive Alone Offpeak	11,399,239
SCAG Shared Ride 2 Offpeak	2,971,802
SCAG Shared Ride 3 Offpeak	1,509,108
SCAG Trucks	1,184,178
Caltrans Statewide (Remaining Urban Areas)	13,045,337
Interregional	1,049,247
Total Daily	69,357,348

6.2 Air Passengers

The air passenger boarding validation, presented in Table 6.5, shows a reasonable comparison of observed to estimated air passengers in every market except two. The Sacramento to San Diego market is overestimated and the other market is underestimated, but all other markets match observed boardings quite closely. The three largest markets match boardings with observed boardings within +/- 2 percent and the overall total air trips match observed boardings within +/- 1 percent.

Table 6.5 2000 Air Passenger Boarding Validation

Market	Observed Adjusted	Model	Difference
LA to Sacramento	12,308	12,170	(138)
LA to San Diego	387	70	(317)
LA to SF	29,329	28,890	(439)
Sacramento to SF	8	22	14
Sacramento to San Diego	3,848	5,030	1,182
San Diego to SF	8,096	8,263	167
LA/SF to SJV	140	137	(3)
Other	1,040	294	(746)
Total	**55,156**	**54,876**	**(280)**

6.3 Conventional Rail Passengers

The rail passenger boarding validation, presented in Table 6.6, shows a comparison of observed to estimated rail passengers by operator. These include all conventional rail operators that serve interregional passengers except the Metrolink Orange line, which travels from Los Angeles Union Station to Sierra Madre Villa in the San Diego region. The Metrolink Orange line was modeled as an interregional service, but not validated separately since the majority of the service was intraregional. The Altamont Commuter Express market is slightly underestimated and the Amtrak Surfliner is slightly overestimated. The other rail markets are reasonable. The overall conventional rail assignments are within +/- 11 percent of observed.

Table 6.6 2000 Rail Passenger Boarding Validation

Market	Observed	Intraregional Models	Interregional Model	20000 Model Total	Difference
Altamont Commuter Express (ACE)	3,100	836	451	1,287	(1,813)
Amtrak Surfliner	5,100	2,966	5,122	8,088	2,988
Amtrak San Joaquin	2,110	452	2,350	2,802	692
Amtrak Capital Corridor	3,300	1,094	1,872	2,966	(334)
Total	**13,610**	**5,348**	**9,795**	**15,143**	**1,533**

6.4 Highway Assignment

Table 6.7 presents the highway assignment in four classifications of roadways: facility type, area type, region, and gateway. There are five facility types; these are grouped into three categories for this report. The freeways and expressways reflect the vast majority of vehicle miles traveled on statewide facilities (95 percent) and these facilities are within two percent of observed volumes. The arterials are overestimated but are not the focus of the study given their limited use for interregional travel. Additional network review and highway validation could improve these results. The highway assignment compares well to observed volumes by area type. All categories are within +/-14 percent of observed.

The highway assignment summarized by region shows that the regions of significance to the high-speed rail study are all within +/-20 percent of observed volumes, except for the SCAG region, which does not reflect the full set of counts in the region. These will be included in the final report consistent with the Final EIS. The Central Coast and Far North regions are outside this target, but are well outside the proposed high-speed rail corridor so this is not a concern. In addition, these regions are not congested, so this underestimation of volumes does not significantly affect travel times across the State.

The gateways established for this study are located in key corridors for high-speed rail and are consistent with the previous set of travel markets evaluated for the trip tables. There are six gateways established. All gateways are within +/-15 percent of observed. Although both the Altamont and Pacheco passes are underestimated slightly, they are well balanced so that there is not a bias towards one pass over the other for the highway validation.

Table 6.7 2000 Highway Assignment Validation

Classification	Locations	Observed	Model	Difference	Percent Difference
Vehicle Miles Traveled By Facility Type					
Freeways/Expressways	1,155	54,807,094	55,666,538	859,443	2%
Major Arterials	179	2,760,912	3,764,260	1,003,348	36%
Minor Arterials/Collectors	25	144,513	148,993	4,422	3%
Total	**1,359**	**57,712,519**	**59,579,791**	**1,867,213**	**3%**
Vehicle Miles Traveled By Area Type					
Rural	836	29,959,583	28,096,076	(1,863,506)	-6%
Suburban	133	4,321,742	4,784,532	462,790	11%
Urban	390	23,431,194	26,699,182	3,267,987	14%
Total	**1,359**	**57,712,519**	**59,579,791**	**1,867,271**	**3%**
Vehicle Miles Traveled By Region					
AMBAG	39	2,166,435	1,572,883	(593,552)	-27%
Central Coast	70	1,756,734	3,054,418	1,297,684	74%
Far North	258	4,684,264	6,763,302	2,079,038	44%
Fresno	46	2,470,711	2,150,050	(320,661)	-13%
Kern	83	3,731,189	3,342,222	(388,967)	-10%
Merced	64	2,092,094	1,717,837	(374,257)	-18%
MTC	176	7,975,231	7,653,524	(321,707)	-4%
SACOG	150	8,416,323	8,495,630	79,308	1%
San Joaquin	90	3,328,091	3,997,801	669,710	20%
SANDAG	141	15,417,924	15,186,348	(231,576)	-2%
SCAG	16	638,858	466,960	(171,898)	-27%
South San Joaquin	20	778,733	697,951	(80,782)	-10%
Stanislaus	44	1,423,711	1,690,356	266,645	19%
W. Sierra Nevada	162	2,832,222	2,790,509	(41,713)	-1%
Total	**1,359**	**57,712,519**	**59,579,791**	**1,867,271**	**3%**
Volumes By Gateway					
SAC to SF on I-80	4	115,536	127,788	12,252	11%
SAC to SJV on I-5 and SR-99	4	109,365	112,105	2,740	3%
SJV to SF on I-580 (Altamont Pass)	4	111,500	95,831	(15,669)	-14%
SJV to SF on SR-152 (Pacheco Pass)	2	20,728	17,705	(3,023)	-15%
SJV to LA on I-5 and SR-14	4	78,927	86,910	7,983	10%
LA to SD on I-5 and I-15	4	442,951	451,154	8,203	2%
Total	**22**	897,651	891,491	(6,160)	-1%

7.0 2030 Forecast

Comparison of the 2030 forecast to a No-Build scenario is completed for validation to ensure that the 2030 forecasts are reasonable for each model component. This 2030 forecast uses a no-build future scenario, based on highway, air, and conventional rail networks developed from state and regional transportation plans. These are described in more detail in the level-of-service assumptions report.[4] The summaries of the 2030 forecasts contained herein focus on the interregional models.

At the heart of any travel forecast is the growth in population and employment. Since the California statewide model is based on households, we present growth based on households and employment in Table 7.1. This table shows that the three largest urban areas (SANDAG, MTC, and SCAG) are growing slower than the average, which is intuitive since these areas are more saturated than other parts of the State. The jobs/housing balance also is presented in this table as it is an indicator of higher numbers of interregional commuting trips.

7.1 Trip Frequency

Trip frequency models for the 2030 No-Build are presented in Table 7.2 for short and Table 7.3 for long trips by trip purpose. The trip frequency models are sensitive to changes in level of service and demographics over time. The three largest metropolitan areas are growing slower than the average because of growing congestion in these areas and slower than average growth in households and employment. The highest growth for interregional travel is beyond the three largest metropolitan areas and is consistent with growth in households and employment for these areas.

On average, the short interregional trips are growing faster than the long interregional trips. As people move further away from the metropolitan regions to find affordable housing, the short interregional travel will increase due to people continuing to work, shop, and recreate within the metropolitan region where they moved from.

The San Francisco region is growing slower than other regions for long interregional trips. This is primarily due to the slower growth in population in this region, but it also may be due to increasing congestion in this area. The Los

[4] Cambridge Systematics, Inc., with Systra Consulting, Inc. and Citilabs, *Bay Area/California High-Speed Rail Ridership and Revenue Forecasting Study Levels of Service Assumptions and Forecast Alternatives*, prepared for the Metropolitan Transportation Commission and the California High-Speed Rail Authority, August 2006.

Angeles region also is growing slightly slower than the average, and has significant congestion.

Table 7.1 Socioeconomic Forecasts from 2000 to 2030 by Region

	Households			Employment			Jobs/Housing Balance		
	2000	2030	Percent Increase	2000	2030	Percent Increase	2000	2030	Percent Increase
AMBAG	226,349	395,441	75%	286,937	436,375	52%	1.27	1.10	-13%
Central Coast	227,200	401,239	77%	278,494	450,495	62%	1.23	1.12	-8%
Far North	376,965	627,223	66%	335,737	522,003	55%	0.89	0.83	-7%
Fresno / Madera	287,110	548,238	91%	365,397	678,779	86%	1.27	1.24	-3%
Kern	207,413	466,354	125%	242,283	707,973	192%	1.17	1.52	30%
South SJ Valley	144,050	271,292	88%	170,813	336,862	97%	1.19	1.24	5%
Merced	63,225	125,340	98%	63,403	130,513	106%	1.00	1.04	4%
SACOG	571,978	916,754	60%	946,259	1,469,052	55%	1.65	1.60	-3%
SANDAG	988,205	1,308,485	32%	1,168,880	1,875,814	60%	1.18	1.43	21%
San Joaquin	180,276	341,264	89%	202,498	345,824	71%	1.12	1.01	-10%
Stanislaus	143,942	311,502	116%	159,900	354,452	122%	1.11	1.14	2%
W. Sierra Nevada	68,929	110,728	61%	55,358	99,057	79%	0.80	0.89	11%
MTC	2,465,287	3,090,739	25%	3,753,533	5,120,598	36%	1.52	1.66	9%
SCAG	5,538,290	7,739,062	40%	7,406,280	10,089,794	36%	1.34	1.30	-3%
Total	11,491,219	16,655,692	45%	15,437,772	22,619,621	47%	1.34	1.36	1%

Table 7.2 Trip Frequency Model Results for Short Trips

Region	Short				2030 Trips	2000 Trips	Percent Increase
	Commute	Business	Recreation	Other			
Sacramento Region (SACOG)	62,787	19,410	28,954	45,493	156,644	83,546	87%
San Diego Region (SANDAG)	37,914	18,767	10,105	10,426	77,212	59,160	31%
San Francisco Region (MTC)	49,692	28,620	37,298	24,287	139,897	99,617	40%
Los Angeles Region (SCAG)	49,704	13,553	48,419	72,508	184,184	141,357	30%
Remainder of CA	544,643	88,295	230,834	288,977	1,152,749	624,394	85%
Total	**744,740**	**168,645**	**355,610**	**441,691**	**1,710,686**	**1,008,074**	**70%**

Table 7.3 Trip Frequency Model Results for Long Trips

Region	Long				2030 Trips	2000 Trips	Percent Increase
	Commute	Business	Recreation	Other			
Sacramento Region (SACOG)	22,421	7,730	29,024	8,531	67,706	45,230	50%
San Diego Region (SANDAG)	30,554	8,837	36,441	12,409	88,241	56,511	56%
San Francisco Region (MTC)	20,520	11,158	122,119	21,130	174,927	136,663	28%
Los Angeles Region (SCAG)	49,588	26,168	97,525	34,039	207,320	142,138	46%
Remainder of CA	145,539	33,996	24,075	1,844	205,454	118,874	73%
Total	**268,622**	**87,889**	**309,184**	**77,953**	**743,648**	**499,416**	**49%**

7.2 Destination Choice

The primary contributors to growth in destination choice are the growth in employment (and to a lesser degree households), and changes in level of service for auto and in certain markets air. Table 7.4 presents the 2030 destination choice model results for 2030 by market and trip purpose.

The long distance markets are more affected by changes in air level of service, because they have higher shares of air travel overall. The San Francisco and Los Angeles regions have the lowest percent growth in employment and the lowest percent growth market overall. This market also has higher air headways between 2000 and 2030, which would tend to lower demand for travel in this market. The Sacramento to San Diego market and markets into and out of the San Joaquin Valley have the highest percent growth overall with higher than average growth in employment. The Sacramento to Los Angeles market has equal headways from 2000 to 2030 for several key airports and as a result, higher growth in overall travel for this market.

The short distance markets are more affected by increasing congestion for autos and growth in employment. The two slowest growing markets are Los Angeles to San Diego and San Francisco to Sacramento. Both are affected by slower growth in employment and by growing congestion in Los Angeles and San Francisco. The fastest growing market is into and out of the San Joaquin Valley, primarily because this area has higher growth in employment than anywhere else.

Table 7.4 Destination Choice Model Results for Short and Long Trips

	Short				Long					
Region	**Commute**	**Business**	**Recreation**	**Other**	**Commute**	**Business**	**Recreation**	**Other**	**2030 Model Trips**	**2000 Model Trips**
LA to Sacramento	0	0	0	0	4,933	2,281	10,403	3,124	20,741	12,414
LA to San Diego	64,036	21,548	48,656	31,283	33,020	12,194	116,182	39,937	366,856	262,936
LA to SF	0	0	0	0	14,010	7,402	28,819	5,373	55,604	54,898
Sacramento to SF	46,747	27,070	24,827	17,435	18,435	7,832	36,002	8,320	186,668	139,580
Sacramento to San Diego	0	0	0	0	1,833	539	2,353	697	5,422	3,033
San Diego to SF	0	0	0	0	6,462	1,948	12,653	2,234	23,297	14,939
LA/SF to SJV	134,393	23,892	30,182	55,096	61,510	20,673	43,376	6,901	376,023	209,524
Other to SJV	228,722	41,916	112,204	137,696	31,452	8,015	132	65	560,202	282,337
To/From Monterey/Central Coast	155,143	25,851	61,126	75,784	53,576	15,508	39,538	7,493	434,019	280,431
To/From Far North	75,652	22,145	62,876	108,384	34,108	8,824	12,919	2,678	327,586	187,527
To/From W. Sierra Nevada	40,047	6,223	15,739	16,013	9,283	2,673	6,807	1,131	97,916	59,871
Total	**744,740**	**168,645**	**355,610**	**441,691**	**268,622**	**87,889**	**309,184**	**77,953**	**2,454,334**	**1,507,490**

7.3 MODE CHOICE

Table 7.5 presents the 2030 mode choice model trips by mode and mode shares. Conventional rail and air trips increase from 2000 and 2030 due to overall growth and increasing congestion on the highway system. Air travel would have increased at a greater rate than shown, but the air headways in many air markets increase from 2000 to 2005 (and beyond to 2030). This results in a decrease in air mode shares as a percent of total trips from 2000 to 2030. Both short and long business and commute trips have greater increases in mode shares for air and rail due to increasing highway congestion in the peak-periods. Table 7.6 presents the full 2030 interregional trips by mode for each travel market.

Table 7.5 2030 Main Mode Choice Model Results

	Short Trips			Long Trips			
Mode	**Business**	**Commute**	**Recreation/ Other**	**Business/ Commute**	**Recreation/ Other**	**2030 Total**	**2000 Model**
Trips by Mode							
Auto	154,370	729,742	795,597	300,994	339,864	2,320,567	1,441,942
Air	-	-		44,317	37,351	81,668	55,935
Rail	14,275	14,998	1,704	11,200	9,922	52,099	9,613
Total	**168,645**	**744,740**	**797,301**	**356,511**	**387,137**	**2,454,334**	**1,507,490**
Mode Shares							
Car	91.5%	98.0%	99.8%	84.4%	87.8%	94.5%	95.7%
Air	0.0%	0.0%	0.0%	12.4%	9.6%	3.4%	3.7%
Rail	8.5%	2.0%	0.2%	3.1%	2.6%	2.1%	0.6%

Table 7.6 2030 Interregional Trips by Mode

Market	Auto	Air	Rail	Total
LA to Sacramento	12,636	8,105	-	20,741
LA to San Diego	340,862	96	25,898	366,856
LA to SF	30,253	25,351	-	55,604
Sacramento to SF	174,844	26	11,798	186,668
Sacramento to San Diego	164	5,258	-	5,422
San Diego to SF	5,038	18,259	-	23,297
LA/SF to SJV	360,177	9,609	6,237	376,023
Other to SJV	553,466	1,944	4,792	560,202
To/From Monterey/ Central Coast	426,056	5,886	2,077	434,019
To/From Far North	320,667	5,957	962	327,586
To/From W. Sierra Nevada	96,404	1,177	335	97,916
Total	**2,320,567**	**81,668**	**52,099**	**2,454,334**

7.4 Trip Assignment

Overall, the highway vehicle miles traveled increase at a faster rate than air and rail boardings because the highway volumes include the fastest growing portions of the State, which are not the predominant air and rail markets. These are faster growing by percent growth, but the majority of the growth still resides in the four major metropolitan areas (San Diego, San Francisco, Los Angeles, and Sacramento). The summary of 2030 no-build trip assignments is provided in Table 7.7, compared to 2000.

Table 7.7 2030 and 2000 Assignments by Mode

Mode and Volume	2000 Model	2030 Model	Growth	Percent Growth
Air Boardings	54,876	80,643	25,767	47%
Rail Boardings	30,287	37,421	7,134	24%
Auto Vehicle Miles Traveled	748,606,510	1,297,116,168	548,509,657	73%

Note: The Auto vehicle miles traveled in this table do not match the remaining auto assignment summaries, because these include all vehicle miles traveled, when the remaining tables include only selected highway segments.

Air Passengers

Table 7.8 presents the summary of air passenger boardings for the 2030 no-build scenario compared to year 2000. Ninety percent of the overall increase in air passenger boardings is contained in three markets – Los Angeles (SCAG) region to Sacramento (SACOG) region, Los Angeles (SCAG) region to San Francisco (MTC) region, and San Diego (SANDAG) region to San Francisco (MTC) region. The decrease in the air boardings from the Los Angeles (SCAG) and San Francisco (MTC) regions into and out of the San Joaquin Valley is due to reduced air headways in this market. The other market includes airports at Monterey, Santa Barbara, and Eureka.

Table 7.8 2030 and 2000 Air Passenger Boardings

Market	2030 Model	2000 Model	Difference	Percent Difference
LA to Sacramento	19,629	12,170	7,459	61%
LA to San Diego	134	70	64	91%
LA to SF	35,491	28,890	6,601	23%
Sacramento to SF	24	22	2	9%
Sacramento to San Diego	6,636	5,030	1,606	32%
San Diego to SF	17,449	8,263	9,186	111%
LA/SF to SJV	102	137	(35)	-26%
Other	1,178	294	884	301%
Total	**80,643**	**54,876**	**25,767**	**47%**

Rail Passengers

Table 7.8 presents the rail passenger boardings for 2030 and 2000 models. The Amtrak San Joaquin grows by more than any other operator, probably because this is not a viable air market (too short) and it serves a growing travel demand. The combination of the Metrolink Orange line and the Amtrak Surfliner is reasonable growth in rail traffic for the Los Angeles to San Diego corridor.

Table 7.9 2030 and 2000 Rail Passenger Boardings

Operator	2030 Model	2000 Model	Difference	Percent Difference
Altamont Commuter Express (ACE)	1,888	1,287	601	47%
Amtrak Capital Corridor	4,854	2,966	1,888	64%
Amtrak San Joaquin	6,538	2,802	3,736	133%
Metrolink Orange	8,125	5,613	2,512	45%
Amtrak Surfliner	13,594	8,088	5,505	68%
Total	**34,999**	**20,756**	**14,242**	**69%**

Auto Passengers

Table 7.9 presents a summary of the highway assignments for the 2030 no-build and 2000 model runs by facility type, area type, region, and gateway. These include selected highway segments only, based on the locations where counts were used in auto assignment validation. The percentage growth in traffic is focused on arterials, rural areas, and fast growing parts of the State, but the absolute growth is still focused in the major metropolitan areas and major markets (as defined for the air and rail assignment summaries).

The arterials and collectors are growing at a faster rate than the freeways, but still contribute only a small portion of overall traffic. Urban streets are growing at a slower rate than rural streets. The San Diego (SANDAG) and Los Angeles (SCAG) regions have the largest growth in highway volumes; San Diego does have high growth in employment and the highest increase in jobs/housing balance of all regions. Both will contribute to higher travel demand for interregional travel. The Southern California gateways are growing at a faster rate than the Northern California gateways. This is due, in part, to the higher growth rates for auto trips in these regions.

Table 7.10 2030 Highway Assignment Validation

Classification	Number of Locations	2000 Model	2030 Model	Growth	Percent Growth
Vehicle Miles Traveled By Facility Type					
Freeways/ Expressways	1,091	54,807,094	121,566,187	66,759,093	122%
Major Arterials	241	2,760,912	10,715,137	7,954,225	288%
Minor Arterials/ Collectors	27	144,513	559,012	414,499	287%
Total	1,359	57,712,519	132,840,336	75,127,817	130%
Vehicle Miles Traveled By Area Type					
Rural	836	29,959,583	71,861,363	41,901,781	140%
Suburban	133	4,321,742	8,415,013	4,093,270	95%
Urban	390	23,431,194	52,563,960	29,132,766	124%
Total	1,359	57,712,519	132,840,336	75,127,817	130%
Vehicle Miles Traveled By Region					
AMBAG	39	2,166,435	3,713,826	1,547,391	71%
Central Coast	70	1,756,734	2,898,109	1,141,375	65%
Far North	258	4,684,264	9,485,713	4,801,449	103%
Fresno	46	2,470,711	4,728,370	2,257,659	91%
Kern	83	3,731,189	8,199,171	4,467,982	120%
Merced	64	2,092,094	4,391,265	2,299,171	110%
MTC	174	7,975,231	9,914,790	1,939,560	24%
SACOG	152	8,416,323	17,686,025	9,269,703	110%
San Joaquin	110	3,328,091	6,560,230	3,232,140	97%
SANDAG	141	15,417,924	53,976,946	38,559,022	250%
SCAG	16	638,858	1,837,889	1,199,031	188%
South San Joaquin	20	778,733	1,316,790	538,056	69%
Stanislaus	44	1,423,711	2,563,491	1,139,780	80%
W. Sierra Nevada	162	2,832,222	5,567,720	2,735,498	97%
Total	1,359	57,712,519	132,840,336	75,127,817	130%
Volumes By Gateway					
SAC to SF on I-80	4	127,788	209,540	81,752	64%
SAC to SJV on I-5 and SR-99	4	112,105	223,089	110,985	99%
SJV to SF on I-580 (Altamont Pass)	4	95,831	167,576	71,745	75%

SJV to SF on SR-152 (Pacheco Pass)	2	17,705	35,330	17,625	100%
SJV to LA on I-5 and SR-14	4	86,910	234,238	147,328	170%
LA to SD on I-5 and I-15	4	451,154	1,083,777	632,623	140%
Total	**22**	891,491	1,953,550	1,062,058	119%

8.0 Summary

The 2000 and 2030 no-build forecasting model for the State of California described in this report provide reasonable and logical estimates of trips by mode and highway, air, and conventional rail assignments. These estimates have been compared to observed values for the following model components:

- Trip frequency by purpose and distance class for the four major metropolitan areas and the remainder of the State;
- Origin and destination patterns for 14 regions in California and 11 major travel markets (origin and destination pairs for major metropolitan areas) by purpose and distance class;
- Mode shares for air, conventional rail, and auto trips by purpose and distance class;
- Access and egress mode shares (drive and drop, rental car, taxi, drive and park, transit, and walk) for air and conventional rail trips by purpose and distance class;
- Air boardings for seven major travel markets in California;
- Conventional rail boardings for interregional rail operators in California; and
- Auto vehicle assignments by facility type, area type, region, and gateway compared to traffic counts.

This report also contains details on the model calibration process and the resulting alternative specific constants used in each model component.

These models were calibrated and validated for use in forecasting high-speed rail ridership for the Draft Environmental Impact Statement for the Bay Area to Central Valley High-Speed Train Program.[5] This Draft Report and other supporting technical documentation is provided on the CHSRA web site.[6] While no calibration and validation process is ever perfect, the process used herein has focused on the most important characteristics and geographies that will impact high-speed rail ridership, to ensure the reliability of these forecasts. The results were reviewed extensively by the consultant team and members of the MTC and CHSRA staff.

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[5] California High-Speed Rail Authority, *Draft Bay Area to Central Valley High-Speed Train (HST) Program Environmental Impact Report/ Environmental Impact Statement (EIR/EIS)*, June 2007.

[6] http://www.cahighspeedrail.ca.gov/ridership/